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ABSTRACT

A study involving three profoundly retarded adults was designed to investigate the efficacy of a stair step diagonal training progression in promoting correct responses to untrained action-object verbal instructions. Procedures included pretraining assessment of action verbs and nouns, matrix training in which each S was physically put through the process of grasping the correct object and making the correct motor response, and generalization probes. In each case, the stair step matrix training procedures were sufficient to promote the performance of recombined action-object verbal instructions in Ss. Figures are included which offer statistical data. (SB)

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RECOMBINATIVE GENERALIZATION OF ACTION-OBJECT VERBAL INSTRUCTION FOLLOWING BY PROFOUNDLY RETARDED INDIVIDUALS

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RECOMBINATIVE GENERALIZATION OF ACTION-OBJECT VERBAL INSTRUCTION-FOLLOWING BY PROFOUNDLY RETARDED INDIVIDUALS

The present research was designed to determine if a matrix training strategy could be used to promote generalized recombinative responses to action-object verbal instructions by profoundly retarded adults. Matrix training strategies have been used successfully with severely retarded children by Striefel, Wetherby, and Karlan (1976, 1978). These researchers found that it was possible to expand the verbal instruction-following repertoire of severely retarded children beyond that directly taught by employing one or more matrix training strategies.

The present research was designed with two particular purposes in mind. First, the efficacy of a stair-step diagonal training progression through an action-object matrix was examined to see if it would promote correct responses to untrained action-object verbal instructions. Second, this research served to extend the generality of the previous research by Striefel, et al. (1976, 1978) to a new population, profoundly retarded adults.

METHOD

Subjects

Three profoundly retarded adults, Howard, Bill, and Rollo (pseudonyms) who were 37, 51, and 61 years of age, respectively, served as subjects. Each of the three subjects had a reported Stanford-Binet, Form L-M, IQ score of less than 10. Howard and Bill's adaptive behavior repertoires were reported to fall in the severe range of the AAMD Adaptive Behavior Scale. Rollo's rated adaptive behavior fell in the profound range on the same scale. All of the subjects were ambulatory, self-feeding, and self-toileting.

Setting

The research was conducted at a large residential facility for mentally retarded people in middle Tennessee. All sessions occurred in a small room containing the necessary furniture, stimulus objects and recording materials. One subject and the experimenter were present during each session. The subject sat at a table adjacent to the experimenter during each session. Sessions lasted 30 to 45 minutes and occurred four to five days a week. An observer was present on approximately 20% of the sessions.

Procedures

The procedures included: (1) pretraining assessment; (2) matrix training; and (3) generalization probes.

Pretraining Assessment. Pretraining assessment on a number of verbs and nouns was conducted to identify a list of actions and objects not known by any of the subjects. Each action and object used in the study was assessed at least 18 times. Object nouns were assessed by placing the targeted object plus two other objects in front of the subject and asking him to identify the named object. Any object correctly identified six or more times was excluded from the experiment.

Action verbs were assessed in a similar fashion. The subjects were asked to make specified action responses in the presence of three objects. An action response was considered correct if the subject made the appropriate response with any available object. Any action verb correctly performed more than three times on a minimum of 18 trials was not used in the present experiment.

Pretraining assessment continued until sufficient verbs and nouns were found that the subjects did not know, to construct three 4x4 action-object matrices; one for each subject.

Matrix Training. Each subject was trained on seven action-object verbal instructions which comprised a stair-step diagonal progression through his matrix.

Figures 1, 2, and 3 represent the matrices for Howard, Bill, and Rollo, respectively. The cells labeled T(1-7) indicate action-object instruction which the subjects acquired from training. It may be seen that the stair-step diagonal training progression for Bill was different from Howard's and Rollo's. Howard and Rollo progressed across actions with the same object when moving from T1 to T2. On the other hand, Bill progressed across objects with the same action when moving from T1 to T2. Cells with letters A, B, or C represent the action-object instructional recombinations which served as generalization probes. The letters A, B, and C differentiate three categories of generalization probes. The items labeled A are recombined instructions which may be formed by the actions and objects contained in training items T(1-4). The items labeled B are recombined instructions which may be formed by adding the actions and objects contained in training items T(5-6) to the actions and objects contained in T(1-4). The items labeled C are additional recombined instructions which may be formed by using the action and object contained in training item T7. Thus, it may be noted that as training progressed in a stair-step diagonal through the matrix, three categories of recombined generalization instructions were sequentially constructed.

Training consisted of two types of sessions: (1) concurrent training sessions, and (2) random sequence sessions. Concurrent training involved teaching the targeted instructions two at a time to criteria. The odd instruction was paired with the first instruction taught to maintain the concurrent training procedure. Concurrent training was accomplished by presenting either of the two action-object verbal instruction in a random fashion. Each trial consisted of the experimenter placing three objects on the table in front of the subject and saying, for example, "Howard, wave paperclip". The subject was physically put through the process of grasping the correct object and making the correct motor response. Physical guidance

was faded to gestural, which in turn was faded out. Correct responses were reinforced. When the subjects performed each of the two instructions correctly five times in a row for a total of 10 consecutive correct responses, they advanced to a random sequence.

The random sequence procedure was designed to assess the subjects discriminative performance on the newly trained items and probe performance on nontrained combinations of the verbs and nouns. A random sequence consisted of five trials on each of the two newly trained instructions, one trial on each review and to-be-trained item and one trial on each of the nine possible recombined instructions which constituted the generalization probes. Random sequence trials were scored correct or incorrect, and correct responses were reinforced. The subject advanced to the next pair of training items when he successfully completed three random sequences over two days without missing each newly trained instruction more than once per random sequence session.

Generalization Probes. The generalization probes (labeled A, B, and C in Figures 1, 2, and 3) were composed of individual actions and objects which were taught as elements of the training items. Since generalization probes were repeatedly reassessed throughout the study in the random sequence sessions, each occurred under two different conditions: (1) Baseline, and (2) Intervention. The baseline condition derived from random sequence trials in which the probe occurred before its verbal elements were trained. In the intervention condition generalization probes occurred after training on its elements. The performance of a generalization probe after intervention indicated that the subject had acquired the individual verbal elements, and the ability to respond to those elements in untrained, recombined verbal instructions.

Experimental Design. The experiemental design for this study was a multiple-baseline across responses replicated with three subjects. The primary dependent

variable was the response to nontrained action-object combinations. These generalization probes represented recombinations of the individual elements from the seven trained items. As training progressed along the stair-step diagonal path through the matrix, the elements of the seven nontrained action-object responses were taught. For example, after Rollo was taught , "Flip coupon", "Press coupon", "Press spool", and "Place spool", it was possible for him to also respond correctly to "Place coupon", and "Flip spool". The training of the next two instructions made four new recombinations possible, and the last item trained made the final three nontrained probes possible. The sequential potential for correct response to the nontrained instructions provided a multiple-baseline control.

Interobserver Agreement. An observer independently scored all trials in 20% of the sessions. Interobserver agreement was calculated by dividing the number of agreements by the number of disagreements plus the number of agreements and multiplying by 100. Interobserver agreement ranged from 88% to 100% with a medium of 96%.

Results. Figure 4 provides a summary for the number of trials to criteria for the three subjects on each of their seven action-object training responses. There was considerable variation across subjects and across responses on trials to criteria. Rollo required the greatest number of trials with a total of 5,537. Bill required the lowest, 2,295. Bill's performance seemed to indicate that he acquired new items with fewer trials as training progressed. On the other hand, Howard seemed to require more trials for each new item. Howard completed training after 3,373 trials. In spite of the differences, the subjects' performance or recombined action-object generalization probes was similar.

A summary of Howard's performance is presented in Figure 5. With the exception of one of the B probes, Howard did not perform recombined probes until the elements which were a part of the instruction were trained as a part of one of the original training items. The training items pertinent to A probes included "Blow gasket"

and "Turn gasket". During the baseline condition, Howard failed to demonstrate either of the A probes, "Wave gasket" or Blow solder". At this point, he had not been taught the verbal elements, "Wave" or "Solder". However, after training the instruction, "Turn solder" and "Wave solder", Howard correctly performed both of the A probes.

Howard demonstrated one of the B probes, "Blow paperclip", during baseline. In this case, the action element, "Blow", had been trained prior to Howard's correct response. It is possible that having acquired the action, Howard inadvertently picked the correct object. Such an event had a 33-1/3% chance probability of occurrence. None of the other B probes were correctly performed until the items containing their components were trained. C probes required the training of an additional item in order to introduce the necessary verbal elements to Howard's instruction-following repertoire. This training was followed by Howard's performance of two out of the three C probes. Howard demonstrated 8 out of 9, or 89%, of the possible action-object recombined instructions. The training of seven action-object instruction-following responses was sufficient to expand this subject's repertoire to a total of 16 responses.

Bill also demonstrated an instruction-following repertoire expanded beyond that associated with direct training (see Figure 6). A probe, and B probe intervention both resulted in performance of recombined instructions. Bill, like Howard, also performed one of his B probes during the baseline condition. Here again, it appeared that after learning the appropriate action element, the subject inadvertently picked the correct object.

One major difference between Howard and Bill, was Bill's failure to perform any of his C probes. After training on "Push bobbin", Bill failed to demonstrate any of the C probes (Push alligator, Push tuffy, and Push funnel) all of which contained the verb element "Push". Bill was the only subject who failed to demonstrate some minimal level of correct response to all three probe categories. It

seemed that his failure may have been associated with the organization of his training progression through the matrix. Because "Push" was part of the last instruction trained, Bill was not required to attend to "Push" as a discrete verbal element. "Push" was never taught in combination with any object other than "Bobbin". Therefore, he may have failed to discriminate the meaning of "Push" separate from the object element so that it could be recombined with different object elements. Never-the-less, the stair-step matrix training strategy was sufficient to promote appropriate performance for six out of nine, or 66%, of his possible action-object recombined instructions.

Rollo's recombined instruction-following performance (see Figure 7) was similar to Howard's and Bill's. In each case, training on the verbal elements necessary for the three probe categories was followed by appropriate performance. In total, Rollo demonstrated seven out of the nine, or 78%, of the possible recombined, but untrained instruction-following responses.

Discussion. In each case, the stair-step matrix training procedures were sufficient to promote the performance of recombined action-object verbal instructions in these profoundly retarded subjects.

The procedures associated with the stair-step matrix strategy suggest a systematic procedure for expanding the instruction-following repertoire beyond that accomplished by direct training. These procedures are apparently effective with profoundly retarded persons just as they are with severely retarded persons as found by Striefel, and associates (1976, 1978). Striefel and associates (1978) have also provided evidence suggesting that the two dimensional matrix associated with actions and objects may be expanded to include adjectives. Future research may investigate the efficacy of adding additional dimensions as well as other types of verbal elements.

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ACTIONS

OBJECTS	Blow	Turn	Wave	Pull
Gasket	T1	T2	A	B
Solder	A	T3	T4	B
Paperclip	B	B	T5	T6
Yarn	C	C	C	T7

Figure 1. Matrix training items and generalization probes for Howard. T(1-7) are training items. A items are the first category generalization probes; B items are the second category generalization probes; and C items are the third category generalization probes.

ACTIONS

OBJECTS	Switch	Cover	Hand	Push
Alligator	T1	A	B	C
Tuffy	T2	T3	B	C
Funnel	A	T4	T5	C
Bobbin	B	B	T6	T7

Figure 2. Matrix training items and generalization probes for Bill. T (1-7) are training items. A items are the first category generalization probes; B items are the second category generalization probes; and, C items are the third category generalzation probes.

ACTIONS

OBJECTS	Flip	Press	Place	Grasp
Coupon	T1	T2	A	B
Spool	A	T3	T4	B
Pebble	B	B	T5	T6
Plastic	C	C	C	T7

Figure 3. Matrix training items and generalization probes for Rollo. T (1-7) were training items. A items were the first category generalization probes; B items were the second category generalization probes; and, C items were the third category generalization probes.

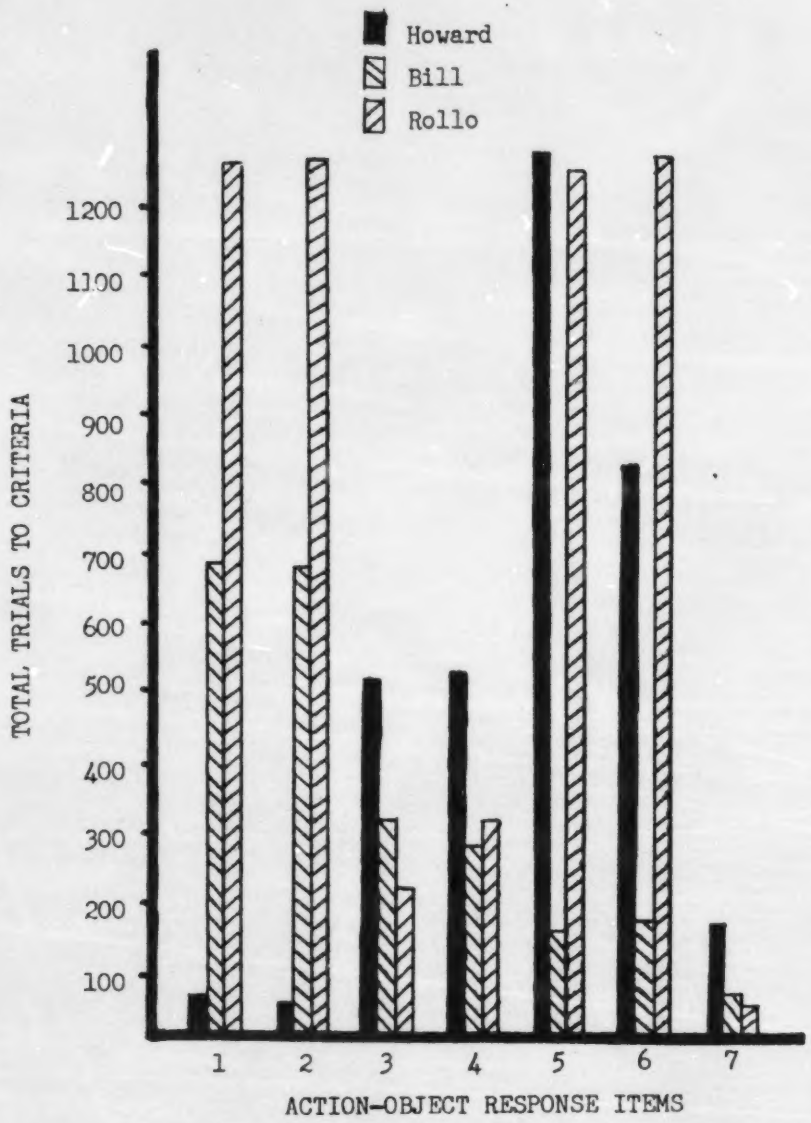

Figure 4. Trials to criteria by each of the three subjects for each of the seven action-object responses trained.

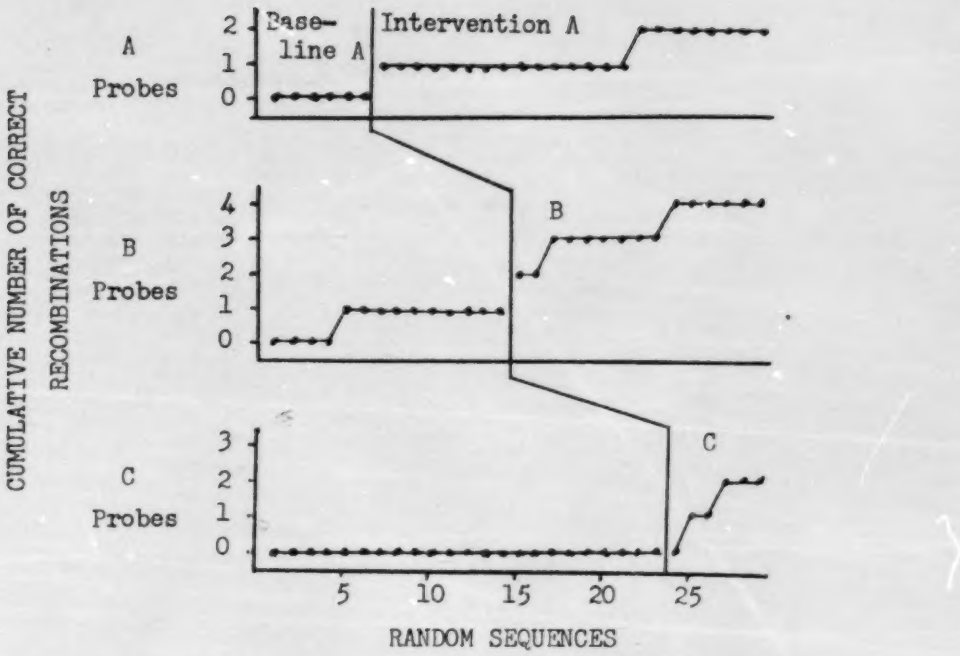

Figure 5. Cumulative number of correct recombined action-object responses across random sequences for Howard (Baseline A: Train Blow gasket and Turn gasket; Intervention A: Train Turn solder and Wave solder; Intervention B: Train Wave paperclip and Pull paperclip; Intervention C: Train Pull yarn and review Blow gasket).

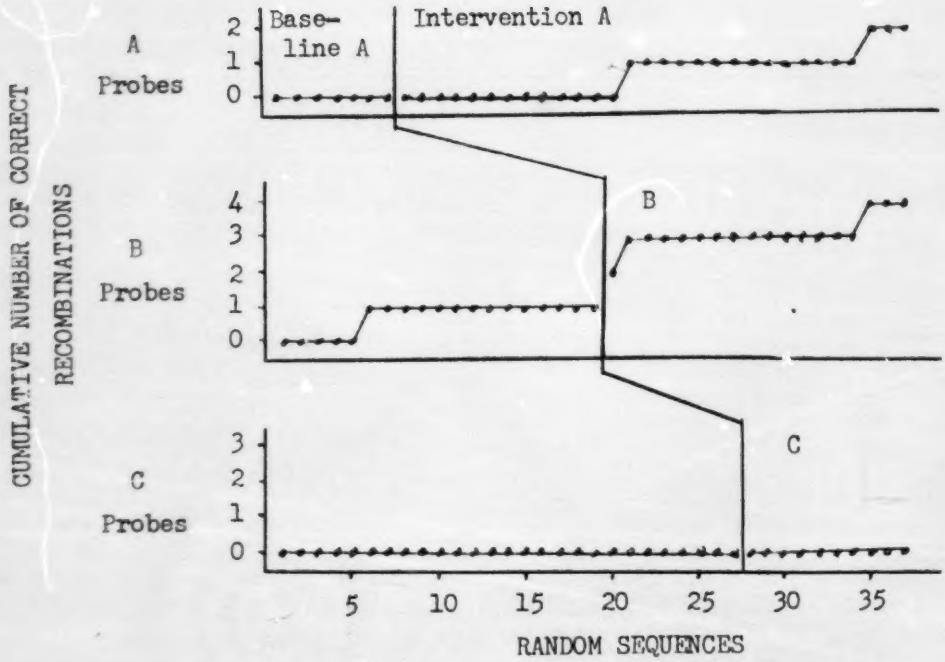

Figure 6. Cumulative number of correct recombined action-object responses across random sequences for Bill (Baseline A: Train Switch alligator and Switch tuffy; Intervention A: Train Cover tuffy and Cover funnel; Intervention B: Train Hand funnel and Hand bobbin; Intervention C: Train Push bobbin and review Switch alligator).

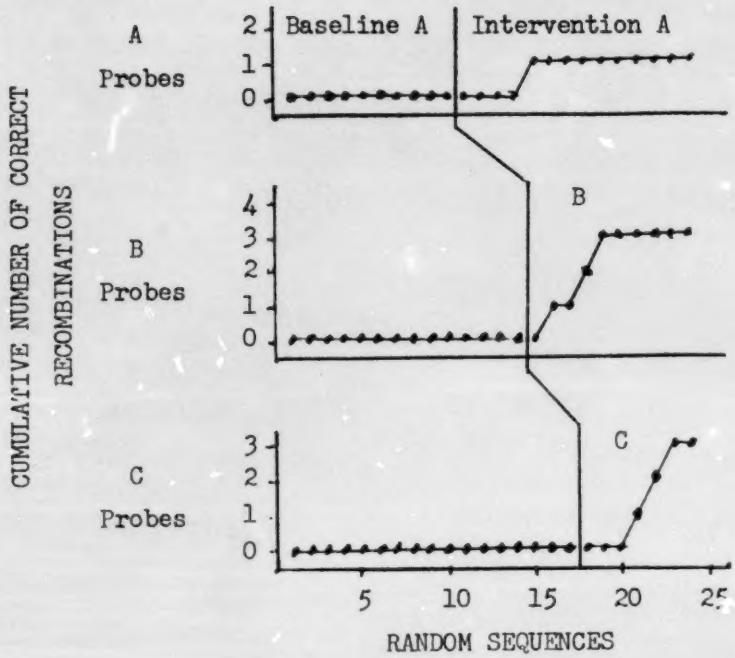

Figure 7. Cumulative number of correct recombined action–object responses across random sequences for Rollo (Baseline A: Train Flip coupon and Press coupon; Intervention A: Train Press spool and Place spool; Intervention B: Train Place pebble and Grasp pebble; Intervention C: Train Grasp plastic and review Flip coupon).